DOCUMENTS EXPEDITING PROJECT

85th Congress
2d Session

COMMITTEE PRINT

METROPOLITAN WATER PROBLEMS

STAFF REPORT

PREPARED FOR THE

JOINT COMMITTEE ON WASHINGTON METROPOLITAN PROBLEMS

ON

CONSERVATION AND RECREATION IN A COMPREHENSIVE PROGRAM FOR THE POTOMAC RIVER BASIN WITH SPECIAL REFERENCE TO THE NATIONAL CAPITAL REGION

MARCH 1958

Printed for the use of the Joint Committee on Washington Metropolitan Problems

UNITED STATES
GOVERNMENT PRINTING OFFICE
22438 WASHINGTON : 1958

JOINT COMMITTEE ON WASHINGTON METROPOLITAN PROBLEMS

ALAN BIBLE, Nevada, *Chairman*
DEWITT S. HYDE, Maryland, *Vice Chairman*

WAYNE MORSE, Oregon
J. GLENN BEALL, Maryland
JOHN L. McMILLAN, South Carolina
HOWARD W. SMITH, Virginia

FREDERICK GUTHEIM, *Staff Director*

II

FOREWORD

The Joint Committee on Washington Metropolitan Problems, pursuant to the terms of House Concurrent Resolution 172, 85th Congress, is conducting a series of studies of the growth and expansion of the Washington metropolitan region. The scope of this investigation has been outlined in the committee's progress report, published as Senate Report 1230. To facilitate studies by the committee and the presentation of material in public hearings, a series of staff working papers are being prepared.

The following paper, by Bernard Frank, Assistant Director, Division of Watershed Management Research, United States Forest Service, is one of a group of three working papers dealing with aspects of the metropolitan water problem. Mr. Frank's services have been made available to the joint committee for this assignment, and his paper is thus an independent professional opinion rather than an expression of the viewpoint of the Forest Service.

FREDERICK GUTHEIM, *Staff Director.*

ACKNOWLEDGMENT

In the course of preparing this report, the author has made informal requests for information from units of the public agencies listed below and wishes to acknowledge their cooperation.

Department of Agriculture.—Agricultural Research Service, Forest Service and Soil Conservation Service.

Department of the Interior.—Fish and Wildlife Service.

State of Maryland.—Department of Game and Inland Fish.

The Interstate Commission on the Potomac River Basin.—This agency furnished the recreation map. The watershed sketch was furnished by the Forest Service.

The author wishes to make clear that he is solely responsible for the factual and interpretative content of the report, and that the opinions expressed therein do not necessarily reflect the policies or opinions of any agency with which he is or has been associated.

WATERSHED IMPACTS OF METROPOLITAN GROWTH

Few population centers are so closely identified with an interstate river system as is metropolitan Washington. This metropolis of more than 2 million inhabitants already forms part of a huge conglomeration of urban areas stretching almost unbroken from southern New Hampshire to northeastern Virginia. Urban concentrations in the National Capital region have long since spread out beyond the District of Columbia on both sides of the Potomac River and both upstream and downstream in Virginia and Maryland.

The years ahead will see this intimacy of river and people become even closer. We can expect the region's inhabitants, provided with speedy transportation media, to seek outdoor enjoyment and relaxation throughout the Potomac River Basin from the cool, mountainous headwaters in West Virginia, some 270 river miles above Washington, to the mouth at Chesapeake Bay's Point Lookout, 117 river miles below Washington.

In its tortuous 400-mile course from mountain to bay, the Potomac River traverses several climatic, geologic, and physiographic regions, each rich in economic, scenic, and recreational potentialities. All of the river down to Washington is flowing water. Some of the reaches of the main stem and its tributaries offer spectacular views of deeply incised gorges and churning rapids and afford equally thrilling white-water fishing and boating.

During our Nation's early history the Potomac, breaching the Blue Ridge and other formidable mountain barriers, represented a beckoning gateway to the Ohio River and the West. Today the historic Cheasapeake & Ohio Canal, paralleling the river for 185 miles from Georgetown to Cumberland, Md., stands as an historic monument to the aspirations, visions, energy, and organizing genius of George Washington and his associates. And today the valley of the Potomac, scene of many fierce Civil War battles, still beckons the adventurous, rest-seeking, or natural-science-minded tourist and vacationist and offers promising economic opportunities in the management and utilization of its varied natural resources.

The life and growth of the Nation's metropolis are tied to the Potomac River and its 9.3 million-acre watershed in many other ways. Indeed, the future use and development of this river basin must inevitably be influenced by the physical, economic, and cultural demands of the metropolitan region. Already questions have arisen and discussion and debate aroused over the future ability of the river and its tributaries in Maryland, Virginia, West Virginia, and Pennsylvania to meet the expected higher demands for water supply, waste disposal, and electric power, as well as for fishing, hunting, swimming, boating, and other recreational opportunities. These requirements may well be more than double those of today within a short 20–25 years hence, when the population of Washington is expected to have attained at least

twice its present number, and be in a much more favorable position to enjoy the basin's recreational opportunities.

The rapid growth and expansion of the Washington metropolitan area, sketched in the joint committee's progress report, emphasize the development problems of the Potomac drainage basin upstream from the District of Columbia. The character of the 1947–55 period of growth has been more greatly decentralized and diffused, and more remote from organized water and sewer systems. Government dispersal activities are creating major concentrations of employment in this area. The industrial base of the metropolitan region is expanding, due in part to the tendency of the city to diversify as its size increases, and in response to the promotional activities of suburban counties. These are important background elements in Potomac watershed considerations.

The ability of the river and its watershed lands to meet Metropolitan Washington's needs for clean, safe and well-regulated water—as well as for recreational use—depends in turn upon how its forest, crop and pasture lands, which make up the great bulk of its 9.3 million acres, are protected, managed, and utilized. This task cannot be accomplished exclusively—or even primarily—by engineering works. The condition and use of these lands directly and indirectly affect the character and distribution of the Potomac's flows down to Washington and below. For example, much of the river's estimated average annual silt load of some 1.7 million tons (1) [1] or some 150 tons per square mile per year (earlier estimates have run as high as 5.5 million tons), originates on farm and forest lands on the mountain slopes and coves, and the Great Valley and Piedmont regions from which the naturally erosive soils are torn loose and washed downstream by injudicious and wasteful practices. In more recent years the rapid expansion of urban development and highway construction, especially around Washington, has sent much higher amounts of silt per square mile into the main Potomac from such tributaries as Holmes Run in Fairfax County, Va, and Rock Creek and the Northwest Branch of the Anacostia River in Montgomery and Prince Georges Counties, Md. Such silt—much of which stays afloat for days after rains—depresses the utility, sport fishing and other recreational values of flowing streams and especially of water detained behind the dams of ponds or reservoirs. A recent report by Dr. Abel Wolman and associates describes siltation as a major factor in the Potomac's polluted condition (2).

The effects of siltation are especially noticeable during and after heavy rains. A 5-day wet period in April 1937 brought over 2.2 million tons down past the 14th Street Bridge. During the March 1936 flood, turbidities rose as high as 6,000 parts per million, as against acceptable public health standards for municipal water of only 10 parts per million. Such excess amounts of floating silt greatly increase the cost of filtering our drinking water.

The settling of heavier soil particles in the navigable tidewater reach between Rock Creek and Hains Point is responsible for an annual dredging burden of 135,000 cubic yards to maintain the channel. Much more settles upstream to Chain Bridge at the limit of tidewater where the swift current slows down to drop its load of mud.

[1] Figures in parentheses ( ) refer to references cited at end of this report (p. 18).

Public health authorities do not consider such waters safe for swimming and do what they can to discourage it. Nevertheless hundreds of people bathe and swim in the Potomac and Monocacy Rivers and in Seneca Creek when the water is so thick with yellow or reddish mud as to make it impossible for the swimmer to see his hand beneath the water.

LAND VARIES IN PRODUCTIVITY

The Potomac Basin's hinterland boasts a variety of raw materials from farm and forest, and from subsurface minerals, especially coal. The Shenandoah Valley lowland farms, built on rich limestone soils, are highly productive when intelligently managed and produce fine harvests of apples and other fruits. Bottomlands along the Potomac and Shenandoah Rivers and their tributaries, the lower slopes and coves of the long mountain ridges of western Maryland and Virginia, and the flat-to-gently rolling and well drained soils of the Piedmont produce good yields of small grains, hay, and dairy products. Below Washington the sandier Coastal Plain soils support tobacco and truck crops. Elsewhere the thin or rocky sandstone and shale soils, often on steep slopes or ridgetops permit farming of doubtful economic value. Owners of both the more productive and less productive farms often supplement their income by employment in factories or service industries.

Forest lands occupy 4.7 million acres or half the basin's area, but not much over one-third is contributing to the protection of the Potomac's flows and to the region's needs for continuing high-quality crops of mine timbers, sawtimber, pulpwood, railroad ties, and other products, or to much needed woods employment for residents of small farms and rural communities.

Not all of the forest lands could produce profits from timber crops even under management because they grow on shallow, excessively drained, very stony or otherwise less fertile soils, especially on the upland sandstone and shale areas in western Maryland and in Virginia and West Virginia between the Shenandoah River and the Alleghany Plateau (3). Nevertheless such forests as do grow on the more fertile soils of the lower mountain and foothill slopes, most parts of Piedmont Virginia and Maryland, and on the Coastal Plain, are seldom yielding up to their potentials in volume and quality of timber because of past repeated wildfires, improper cutting practices, and soil-damaging logging methods, among other causes.

Yet most of the 4.7 million acres of forest are becoming increasingly valuable to the people of the metropolitan area because these same lands and the watercourses that drain them are furnishing or are capable of furnishing outlets for hunting, fishing, hiking, camping, and many other forms of recreation. That fact has already been established by the 1957 report of the Interstate Commission on the Potomac River Basin, entitled "Potomac Playlands." To the extent the basin's forests can furnish these services, they can also spell sizable economic returns to the rural communities around which they lie. And to the extent their soils and vegetation are protected, improved and intelligently managed, they can help smooth out the extremes of the Potomac's high and low flows, reduce the silt burden, enhance

22438—58——2

wildlife and fishery conditions, and add greatly to the attractiveness of the basin.

Watershed research is very limited in the Potomac River Basin, but results from studies in comparable areas confirm the favorable influences of scientifically developed and applied soil and water conservation practices. In east Tennessee, for example, shifts in land use from poor crop and pasture land to forest (by reforestation), plus improved practices on the remaining open lands, reduced silt discharges from an 85,000-acre mountain watershed by 48 percent over a 10-year period. A similar program on another watershed reduced both summer and winter flood peaks (volume of maximum instantaneous discharges) on small streams by about 65 to 75 percent (4).

The same practices that reduce high flows also raise low flows by facilitating the entry of water into the soil for slow release to streams following rains. Such subsurface water is also much cleaner than the fast surface runoff from packed or paved surfaces, hence more fit for fish and riparian wildlife.

HARMONIZING LAND AND WATER USES

The impact of the National Capital region on the Potomac River Basin as a whole is making itself felt in many ways, as the preceding section has shown. It is evident that the river, its tributaries and their watershed lands will be called on to an ever-increasing extent to furnish a variety of physical, economic, and social services, some of which are bound to enter into conflict with each other unless reasonably equitable solutions can be worked out.

One of the pertinent questions that must be answered is the likely degree and location of industrialization in and around the National Capital region and elsewhere in the basin. So far as this region is concerned, Federal employment, together with the services to Government employees, constitutes the main sources of income, and a strong tendency prevails to keep such activity dominant as against industrialization, especially heavy industries. Elsewhere in the basin, however, the pressures against industrialization are largely lacking. Such development in fact would be welcomed by many communities in western Maryland and West Virginia which are now limited in economic opportunities because of their inherently poor agricultural soils, depleted timber and coal reserves, and underdeveloped recreational resources.

Where and to what extent industrialization spreads in the years to come will inevitably affect the ability of the Potomac River to furnish adequate amounts and qualities of municipal water supplies. Some industries require large amounts of water per unit of product manufactured and, unless properly controlled, can release highly toxic wastes into the streams, thereby destroying aquatic life and otherwise rendering the water unfit for other uses. Pollution problems of this character have already developed on the South Fork of the Shenandoah River near Waynesboro, Va., happily largely corrected, on the North Branch of the Potomac at Luke, W. Va., and in the vicinity of Cumberland, Md., where deadly acidic flows are being released into the river from active and abandoned coal mines on Georges and Wills Creeks.

Such developments are relatively far from Washington. However, we may anticipate pressures for further industrialization, especially along the main Potomac River closer to Washington, that would bring the danger of toxic wastes or otherwise detrimental flows and the problems of their effective continuing control into sharp focus. (In many respects dispersed concentrations of Federal installations, airports, or other intensive uses might have the same consequences.) Aside from the waste control question, industry's heavy demands for water would have to be carefully balanced against the demands of a metropolitan region embracing some 2,300 square miles and by 1980 expected to support high population densities on at least one-third more area than is today so built up.

Per capita water consumption has continued to rise, nationally at least, so that total use can be expected to rise more than proportionately to the increase in population. Municipal demands will naturally have to receive first priority in the event supplies are insufficient for both domestic and industrial purposes. Nevertheless, unless careful advance thought is given to water demands for various purposes, and the means of avoiding or satisfying them, critical situations might develop during extended dry periods.

URBAN DEVELOPMENT PRACTICES NEED IMPROVEMENT

Another source of potential conflict relates to the manner and degree of urban expansion throughout the National Capital region. As previously indicated, silt pollution is one of the obstacles to achieving a clean river and unless subdivision planning, and road building and construction practices are greatly improved, the course of the river through Washington will be muddier than ever. Similarly, local flood runoff from the heavier rains will probably increase by from 3 to 7 times or more, thus increasing the danger to life and property, depreciating real-estate values, and generally favoring neighborhood deterioration in the affected areas.

A former official of Montgomery County, Md., has asserted that the cost of overcoming the storm-drainage problem created by uncontrolled real-estate subdivision practices would amount to around $14 million (5). This estimate was based on conditions existing as of 1953. Problems created by developments undertaken since then would undoubtedly raise this cost by at least 50 percent.

Literally millions of dollars can be saved the taxpayers of the metropolitan area by building conservation practices into developments at the time they are planned. In addition, the extent to which ample open space (woods, grasslands) is preserved in parks, natural areas, golf courses, etc., will have a strong bearing on both silt pollution and storm runoff, on the pressures for recreational use in and beyond the metropolitan region, and even on the water supply and sewage pollution problems. Stream valley parks, floodplain zoning and building limitations, and the location of additional parks on critical watershed slopes would all contribute materially to a cleaner and more useful Potomac.

What the above brief summary of some of the metropolitan problems adds up to is that the Washington area and the Potomac River Basin as a whole are parts of a single natural complex. Growth and expansion in and around the Capital will have repercussions throughout

the basin; and, conversely, what happens in the Potomac hinterland upstream or downstream will affect the economic and cultural interests of the metropolis. In short the land and water problems are all of a piece and need to be studied, analyzed, and worked out accordingly. This calls for more balanced planning and the development of a program wherein each phase of the Potomac Basin's resource situation will be undertaken in relation to and contemporaneous with the other phases in accordance with their respective status and needs for information.

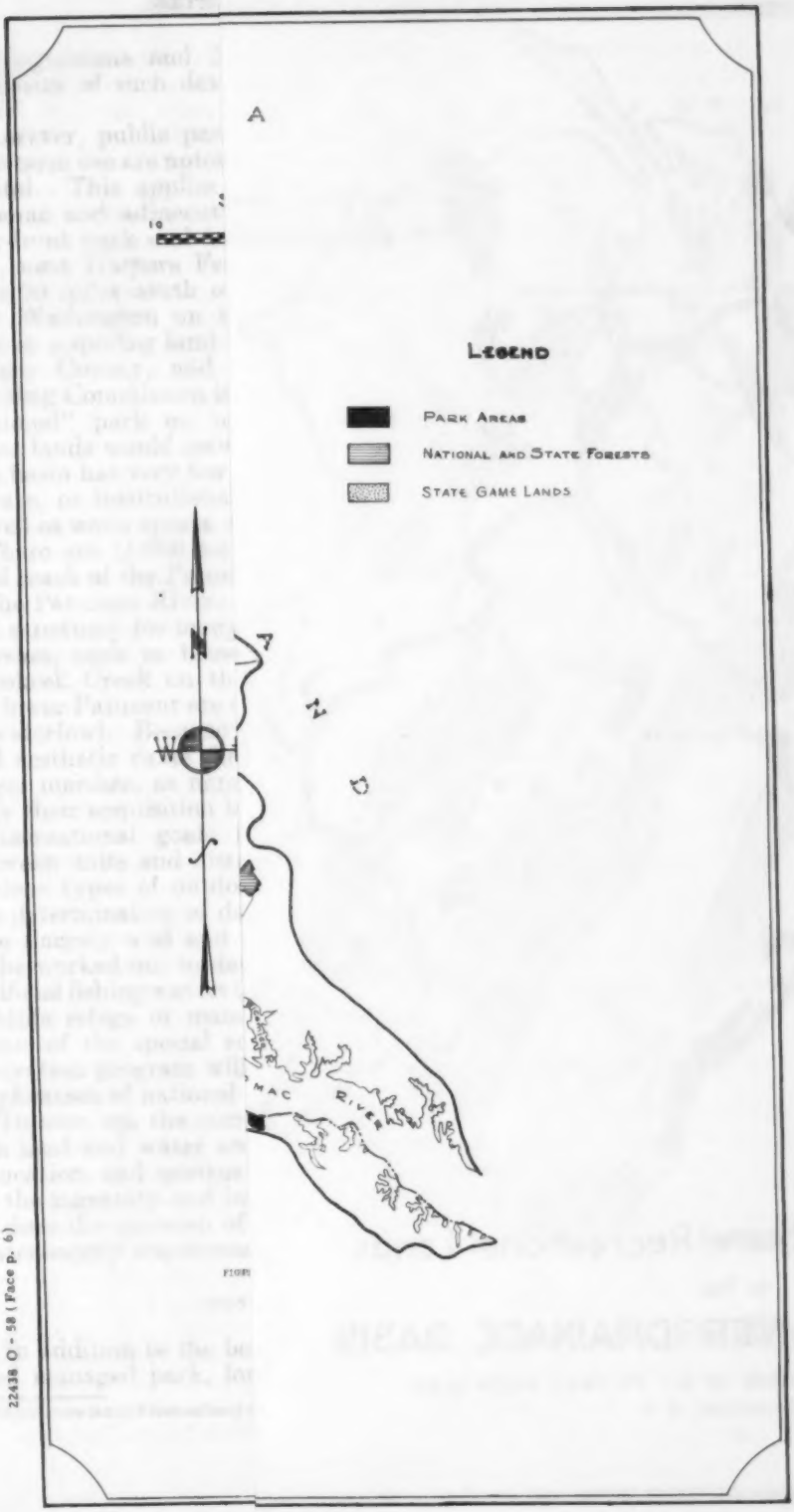
STATUS OF CONSERVATION AND RECREATION

Although the Potomac River Basin as such has been characterized as one of the least developed of the major basins of the United States (6), much has been accomplished by the State and Federal Governments in improving and conserving its soils, waters, forests, fish and wildlife, and in making recreational, scenic, inspirational, and historical resources more accessible to the public. Further progress is occurring under the increasing pressures generated by urban and industrial expansion. Nevertheless the rates of progress are far from meeting the demands created by the present surge of development. Indeed we are falling behind.

Public lands devoted to or available in whole or in part for the above purposes total over 1 million acres. State holdings amount to 346,000 acres, of which 254,000 acres are in State forests, 19,000 acres in parks, and 73,000 acres in game management lands. Federal holdings (other than military reservations) consist largely of the George Washington and Monongahela National Forests in Virginia and West Virginia, which occupy 518,000 acres within the basin (out of their total area of 1,631,000 acres); the Shenandoah National Park with 75,000 acres in the basin (out of a total of 193,000 acres); and a number of other small Federal parks and monuments, including the Chesapeake & Ohio Canal, and areas in Washington, D. C., and its environs totaling about 69,000 acres.

As the recreation map (fig. 1) shows, the great bulk of these lands lie some distance from Washington and are not too well distributed with respect to the occurrence of population centers or as to balance between intensive (mass type) and extensive recreational uses. For example, Virginia has only one 1,355-acre State park as against Maryland's 10 parks with over 6,700 acres; similarly, Virginia's 1 State forest of 400 acres contrasts with Maryland's 5 State forests, totaling about 94,000 acres, and Pennsylvania's 2 forests of over 100,000 acres within the Potomac Basin.

The location of the larger forest and park areas is necessarily dictated by the fact that the wildest, less accessible, most scenic and heavily forested areas are located largely in the mountainous, less populated western part of the basin. These lands and the steep watercourses that drain them are physically best suited to extensive forms of recreation, such as hiking, primitive camping, hunting, trout fishing, and white-water canoeing. A very few small land and water areas have been developed for mass recreation such as Sherando Lake and campground in the George Washington National Forest near Waynesboro, Va., and Cacapon State Park, 100 miles away from Washington in West Virginia. The heavy use of these facilities by



FIGURE

22438 O - 58 (Face p. 6)

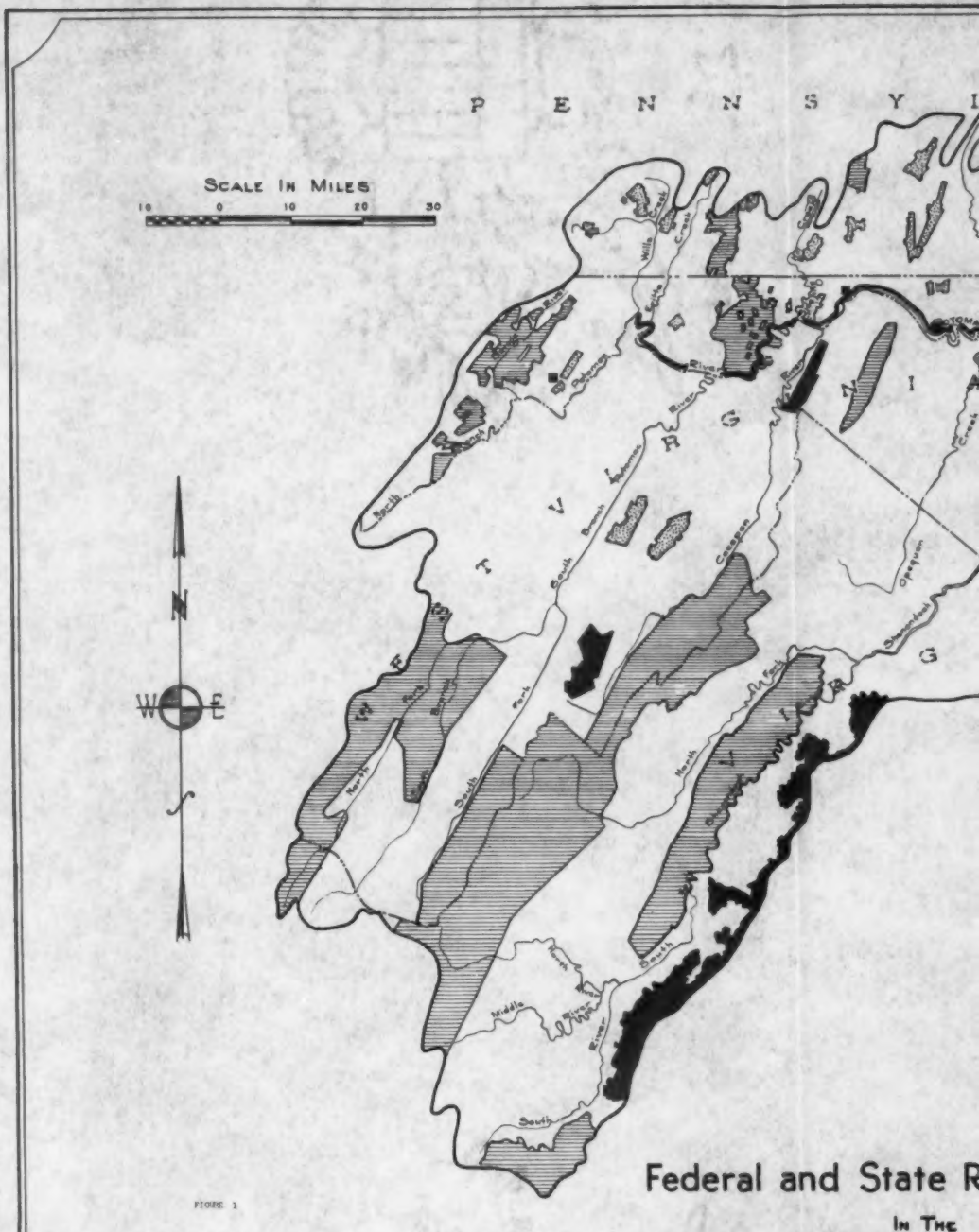


FIGURE 1

Federal and State R

In The

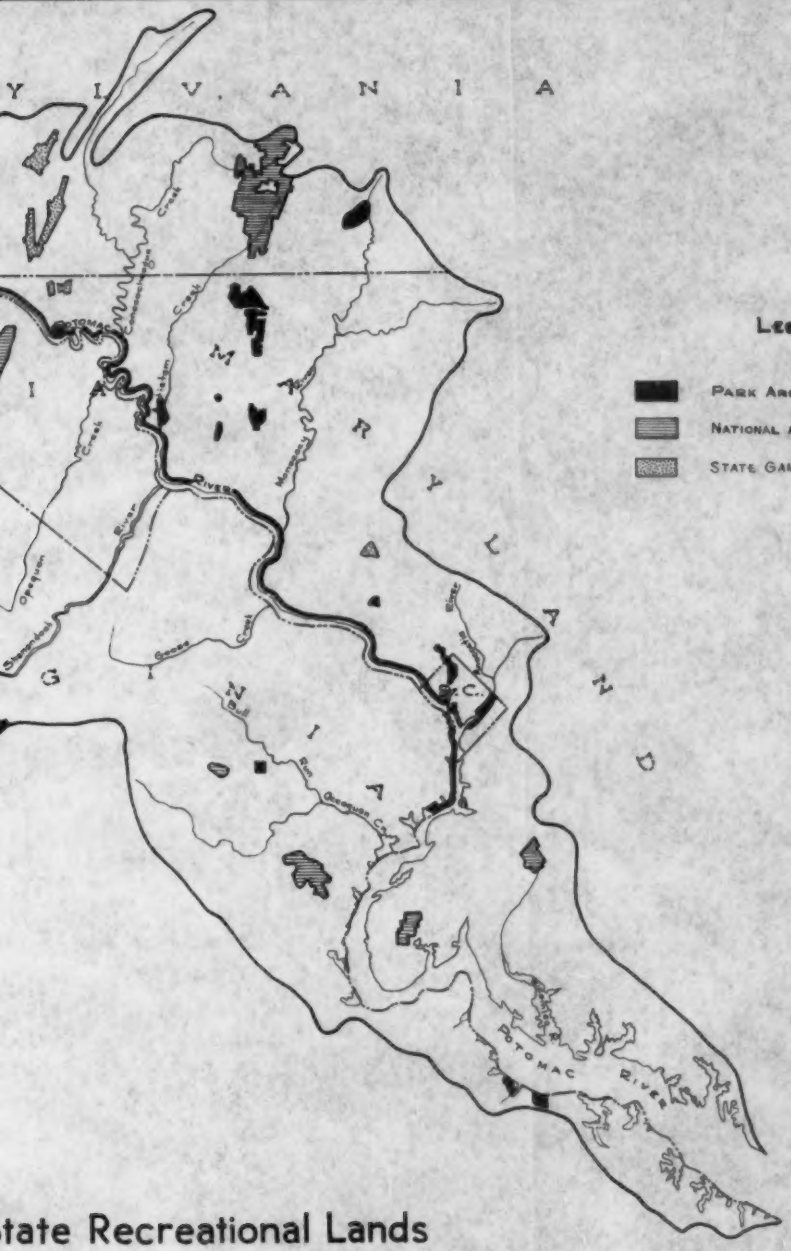
POTOMAC RIVER

INTERSTATE COMMISSION ON TH

WASHINGTON,

1957

22438 O - 58 (Face p. 6)



tate Recreational Lands

In The

IVER DRAINAGE BASIN

SION ON THE POTOMAC RIVER BASIN

SHINGTON, D. C.

1957

Washingtonians and National Capital suburbanites indicates the popularity of such developments and the need for many more like them.[2]

However, public park and recreational facilities for day use and short-term use are notoriously deficient within 50 miles of the Nation's Capital. This applies both above and below Washington on the Potomac and adjacent Chesapeake Bay area. Thus only 1 public river-front park and bathing beach is to be found from Brunswick, Md., near Harpers Ferry, to Virginia's Westmoreland State Park, some 90 miles south of Washington. (Some access is provided by Fort Washington on the Maryland side.) Maryland has made a start in acquiring land for a State park along Seneca Creek in Montgomery County, and the Maryland National Capital Park and Planning Commission is considering acquisition of a 500- to 1,000-acre "regional" park on upper Rock Creek in Montgomery County. These lands would serve extensive uses like hiking and nature study (the basin has very few dedicated nature sanctuaries, either in public, private, or institutional ownership), and perhaps wildlife protection as well as water sports, scouting, picnicking, and playground activities.

There are 11,000 acres of marshland tracts of varying size in the tidal reach of the Potomac River, and 5,500 acres in the lower reaches of the Patuxent River. All these lands are essential in providing food and sanctuary for many species of wildlife, including fish. The larger marshes, such as those along Nanjemoy Creek, Popes Creek, and Accokeek Creek on the lower Potomac, and the Benedict area on the lower Patuxent are especially valuable for wintering concentrations of waterfowl. Because these marshes have such outstanding economic and aesthetic value they should be preserved in their entirety. The larger marshes, as named above, especially need the protection that only their acquisition by the public could assure.

Recreational goals in terms of persons-per-acre ratio, spacing between units and distances from population centers for each of the various types of outdoor land and water recreational facilities, and the determination of desirable balances between intensive and extensive (largely wild and deliberately left undeveloped) areas have yet to be worked out in detail. Similar deficiencies apply to natural and artificial fishing waters (ponds, for example) and to waterfowl and other wildlife refuge or management areas. Meeting these deficiencies in terms of the special conditions and objectives of a Potomac Basin recreation program will demand fresh thinking rather than the mere application of national averages and standards.

To sum up, the correction of the shortages and imbalance among the land and water areas required for recreation, relaxation, nature education, and spiritual refreshment represents as serious a challenge to the ingenuity and initiative of the basin's people and governments as does the question of how to clean up pollution or meet our future water-supply requirements.

CONSERVATION ACHIEVEMENTS

In addition to the beneficial soil protection effects of well protected and managed park, forest, and wildlife areas, the conservation pro-

[2] Data from current recreational survey by Interstate Commission on the Potomac River Basin.

grams of the basin States and Federal Government are also contributing to the gradual improvement of the Potomac River's flows.

Flood-prevention measures, involving floodwater-retarding basins, stream channel, highway slope, and gully stabilization, have been installed within 19 small watersheds occupying one-third of the upper Potomac Basin's area. Soil- and water-conserving practices, leading to reduced surface runoff, erosion, and siltation, are being promoted by 41 agricultural extension agents in the four basin States and by incentive payments to farmers under the agricultural conservation program. Soil conservation districts—State agencies, organized by and for farmers themselves—are operating in 36 of the basin's 38 counties, including the 157,000-acre South River Watershed in Augusta County, Va., which contains active flood- and silt-control operations. Through the cooperative efforts of these districts, the Extension Service, and other local, State, and Federal agencies, soil stabilizing, cover improvement, and water runoff retarding measures have been applied on about 20 percent of the 4.0 million acres in crop and pasture lands since World War II (7).

The Maryland Department of Game and Inland Fish is cooperating with private landowners, sportsmen groups, local communities, the State roads commission, and other State agencies to improve conditions for upland and riparian game, waterfowl and fish. The farm-game refuge area program involves the voluntary setting aside of tracts of from 5 to 50 acres, each to help assure a continuing supply of seed stock of bobwhite quail, cottontail rabbits, and doves and other migratory birds. The Department furnishes trees, shrubs, and grass and legume seeds for food and shelter as well as to protect the soil against erosion and loss of nutrients. It also promotes the construction of fish and waterfowl ponds on farms, at highway fills and around roadside picnic areas, as in the community of Clarksburg, Md.

A small amount of watershed research, confined primarily to crop and pasture lands is underway on 18 areas by the Agricultural Research Service and by the Virginia Agricultural Experiment Station in Maryland and Virginia. Runoff records are being obtained at 96 locations, on drainages varying from 2.4 acres to over 400 square miles in size, and groundwater records are being collected from 35 observation wells. When analyzed, these records will provide valuable data on the expected benefits from soil- and water-conservation practices.

Soil surveys, about 90 percent complete within the basin, are providing basic information. When properly interpreted and applied, this information, together with the results of watershed research, will do more than perhaps any other single factor to facilitate the economic use and continuous management of the crop, pasture, and commercial forest lands on farms and on the public and private forest holdings.

Soil-survey information has proved its worth in urban areas also by indicating the locations where serious drainage and silt and sewage pollution difficulties are most likely to be encountered. Fairfax County, Va., is now utilizing the results of such a survey and of special soil tests in determining where to permit real-estate subdivisions and at what population densities. The county employs a soil scientist to provide technical advice to the planners, health officials, and real-estate developers, among others (8). Past experi-

ences with damaging floods on small streams have also impelled the same suburban county to employ a firm of engineering consultants to advise on storm drainage facilities in built-up areas and on flood hazards throughout the county as an additional basis for guiding real-estate developments. The object, a very wise one, is to avoid heavy public damage, repair and maintenance costs, and possibly loss of life in the years ahead when the values at stake will be much higher than they are now.

Flood prevention and silt reduction are also receiving attention on the 76 square mile Rock Creek Watershed in the District of Columbia and Montgomery County, Md. Following representations by citizens groups and State and Federal approval of an application for planning assistance jointly sponsored by the Montgomery Soil Conservation District and the government of Montgomery County, the Soil Conservation Service of the United States Department of Agriculture initiated a watershed-improvement survey, still in progress as this report is being written. Expected recommendations of the watershed planning party and local groups will include several small combination floodwater detention and recreation reservoirs on upper Rock Creek and its tributaries, together with the acquisition of park land around the reservoirs to protect the public investment and furnish badly needed play space and nature study opportunities. Others will call for improved conservation and beautification practices on farms and along rural roads and highways, stabilization and scenic restoration of Rock Creek's fast-eroding streambanks, and the development of measures for reducing the heavy mud flows and debris which typically originate on residential construction sites during rains or snowmelt.

The Rock Creek situation is unique in that the present watershed survey is the first and only one of its kind in the Nation. Other watersheds planned or operating under the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Cong., as amended by Public Law 1018, 84th Cong.) contain urban land, but these built-up areas are usually located on the floodplains at the lower ends of the drainage basins and are sufferers from, rather than sources of, accelerated flooding and siltation. On Rock Creek, however, both the developed areas, and the farms now being subdivided constitute the major flood and silt sources.

Ordinarily the sponsorship of a soil conservation district suffices to obtain consideration of an application for planning assistance. Here, however, the special circumstances led the Maryland State Soil Conservation Committee and the United States Department of Agriculture to require the additional sponsorship of the county government, since soil-conservation districts are not designed to operate in urban areas.

Predicaments comparable to that existing on Rock Creek are fast plaguing localities elsewhere throughout the National Capital region and, in fact, most of the Nation's metropolitan areas. Hence it would be desirable to review the present watershed-protection law with a view to determining whether legislation designed primarily for rural watersheds can cope with the difficulties generated by the drastic land-use changes that accompany urbanization.

Although local or regional authorities should take the initiative in mitigating the harmful impacts of land conversion by enacting zoning ordinances, land development regulations, and reserving open spaces,

well ahead of construction, nevertheless, the value of specialized help through such Federal legislation as the Watershed Protection and Flood Protection Act should not be overlooked.

MAJOR DEFICIENCIES EXIST

Notwithstanding the substantial progress to date, the largest part of meeting our conservation and recreation needs lies ahead. One reason is that the present programs are not geared to meeting the conditions generated by the National Capital region's burgeoning growth. Actually, many of these activities contemplate rural State or county conditions rather than those of an entity dominated by a highly urbanized countryside such as the Potomac River and its basin represents. As a result they fail to emphasize the compelling urgency of a situation that is steadily growing more critical. Land and water protection, improvement, and management measures on the several hundred small watersheds that make up the basin must be accelerated to keep pace with current demands for clean, well-regulated streamflow, economic opportunities, outdoor recreational outlets, and greater amenities of life generally.

An index of the need for faster conservation progress is the fact that the measures actually applied on small watersheds previously approved for flood-prevention work are far behind the work plans. Thus, only about 30 percent of the contour furrowing needed on cropland to save soil and water losses has been installed since the end of the war. Pasture improvement lags even more, with only 15 percent of the 200,000 acres needing it receiving this treatment. Worst of all is the situation on private forest lands. Here only about 5 percent of the land needing tree planting and 1 percent of the area needing forestry practices to increase their productivity and economic returns to their owners have received these treatments. Adequate protection against recurrent wildfires with the damages to soil, streamflow, timber, wildlife, and recreational values that such fires often entail, still lags in the West Virginia portion of the basin.

In addition to the lag in conservation practices, technical information is lacking to permit adequate evaluation of the effects of engineering works. Much more thorough analyses than available knowledge has permitted are required on land and water developments, especially dams, highways, and other structures, as they may affect the nationally cherished geologic and historic features for which the National Capital region is noted. Eight years ago the President's Water Resources Policy Commission introduced an appraisal of the Potomac Basin by stating that—

> Nowhere in the country is the weighing of special interest against general welfare, or the balancing of regional and local desires against national benefits, more difficult. Nowhere is an understanding appraisal of the intangibles in resource development more clearly needed (9).

A more recent exploratory analysis by the University of Maryland's Bureau of Business and Economic Research asserts that—

> No program for the fulfillment of the region can possibly be successful unless it frankly accepts the need for acquiring much more information than is now available with a recognition of the vital interdependence of the many aspects (10).

The objection to meeting such deficiencies, particularly by those who favor the early construction of River Bend Dam as proposed by

the Corps of Engineers in its 1946 survey report (H. Doc. No. 622, 79th Cong., 2d sess.) is that progress in meeting Washington's needs for water supplies, etc., will thereby be hampered. Perhaps the best answer to such objections to the comprehensive approach, which by its nature is inevitably slower than a piecemeal approach, is that expressed in an article entitled "View From a Water Front," in the National Voter for February 1958: "Planning is expensive. But not planning is even more expensive." That statement appears particularly pertinent at a time when unwise decisions might commit manpower and materials sorely needed for other purposes.

Pending further study and final decision on this issue, early steps might well be taken to acquire the riparian lands along both sides of the Potomac from Great Falls upstream. Acquisition would make available for public use badly needed river frontage that otherwise would be subject to high density developments. Such developments would not only deny recreational access to the river but impair the National Capital's water supply.

ELEMENTS OF A COMPREHENSIVE PROGRAM

Any adequate long-range program for the Potomac River Basin must be based on the dominance of the metropolitan area's concerns over the social and economic impacts of individual features and the program as a whole. The land and water conservation, recreation, and wildlife aspects previously described fit well into the situation because they will help maintain the regional economy and better assure the availability of suitable facilities for outdoor enjoyment.

As a minimum, a sound program should have the following objectives:

(1) Effective measures to minimize losses of soil from all lands whose use subjects them to surface runoff and erosion. Such measures are needed not only to check further depreciation of crop, pasture, forest, and semiurban areas, but also to reduce streambank cutting and silt pollution in streams essential for municipal, agricultural, and industrial water supplies, fisheries (both sport and commercial), wildlife, and recreation.

(2) Improved streamflow distribution by combinations of vegetative and supplemental minor mechanical measures to smooth out the extreme low and high flows on the smaller streams and to some extent on the Potomac River itself, especially in its upper reaches.

(3) Increased continuing yields from all classes of land on productive soil dedicated to economic use. Higher net returns by application of sound practices constitute one of the best guarantees of sustained landowner participation in a comprehensive river-basin conservation program. This involves more than management of farm or forest lands for crop production alone.

(4) Improvements in existing park, recreational and related lands and facilities and provision for the more rapid expansion—through public acquisition, easements, and similar arrangements—of such facilities in the urban and rural portions of the basin. The coordination of new land acquisition or control should ensure conservation as well as recreational objectives being served.

(5) Building a sounder knowledge of effective and economical conservation practices and of recreational requirements by the collection

of basic data and the conduct of studies and experiments in those fields where essential knowledge is most lacking.

(6) Building a wider and more intelligent public understanding of the interrelations of land, water, and people as they affect metropolitan Washington, its environs and hinterland, and promoting citizen participation in the planning and coordination of the program.

The first four of the above objectives can be attained in part by accelerating present rates of activity (assuming the additional funds needed are requested and become available) in the already established cooperative conservation, recreation and wildlife programs of the States and Federal Government within the basin. However, the distribution of these activities will also need to be closely examined in light of the basin's future requirements. Thus it will be especially essential to appraise the relationships of these programs to present plans or proposals for transportation, open space reservations, water developments and pollution control in and around the Nation's Capital.

The greatest deficiencies exist in respect to the fifth objective. A strong program is needed to maximize the multiple values of the basin's lands for watershed protection and streamflow regulation, farm and forest crop production, recreation and wildlife environment.

Watershed research should be greatly expanded to provide reliable information on the effects of vegetation utilization and construction practices on erosion, sediment movements, surface and subsurface water runoff, and water yields. This should be done for each of the major types of soils and topography in each of the main physical regions of which the Potomac Basin is composed: the Allegheny Plateau, Ridge and Valley Province, Piedmont Plateau, and Coastal Plain. Such research should be undertaken on agricultural, forest, and urban lands by the Agricultural Research Service and Forest Service (both of the U. S. Department of Agriculture) in cooperation with the research institutions and technical operating agencies of the Basin States. It would consist here largely of relatively short-term studies and experiments designed to provide practical information applicable to particular sets of soil, vegetation, slope, and land-use conditions. (The research on basic principles and relations is being undertaken elsewhere.)

Among other benefits, this type of research will indicate the prospects for more effective control of the smaller, more frequent floods originating on crop, pasture, or forest lands by means of improvements and management practices according to the ability of given kinds of soil to take in, store, and transmit precipitation from storms of given amounts and intensities. Another benefit of considerable importance will be the development of less destructive methods of land clearing, grading, and drainage, on the growing area of land slated for urban or industrial construction within the metropolitan region and elsewhere. The tests of streambank erosion control and highway slope stabilization methods will further indicate how soil and drainage disturbances created by such activities can be reduced or offset.

Forest management research is essential to achieve the optimum economic use of forest lands. One important phase involves determining the relative rates of timber growth on different kinds of land. (For example, white oak stands in the Southern Appalachian Mountains produce over 13,000 board feet per acre in 50 years on "good"

sites, as against only about 3,900 board feet on "poor" sites.) Other phases concern the species of trees most apt to thrive on given types of soil, methods of attaining the establishment of desired kinds of timber trees following cutting, improvement in quality of timber growth through tree breeding, thinnings, and protection against insect and disease damage, upgrading of understocked or otherwise depleted stands, and scientific methods of utilizing, grading, and marketing forest products to enhance the returns to the owner from forestry.

Emphasis in the Potomac River Basin needs to be placed on increasing the supply of pine timber now being depleted by heavy demands for pulpwood and other products. Effort should also be made to encourage the utilization of the much more abundant hardwood timber, and thus to ease the demands on pine and also stimulate greater economic interest in hardwood management.

Another necessary field of research by the Forest Service in cooperation with the States pertains to the integration of timber and game management. Such research would determine the big-game carrying capacities of different kinds of forest areas, and workout methods of reducing damage to valuable timber by deer and other animals. It would also seek to improve habitat conditions for deer, turkey, and squirrel through special timber-cutting practices, planting and seeding of forage plants.

Recreation research is virtually absent in the basin, although surveys, planning, and development are proceeding within the National Capital region and in some other parts of the basin. A recently initiated exploratory survey by the Interstate Commission on the Potomac River Basin shows serious gaps in knowledge of the recreational requirements of different classes of residents, especially metropolites, and large variations in the standards for given types of recreational reservations. One highly essential specific need is a determination of the causes of the trend by private landowners to restrict access to their lands and watercourses by hunters, fishermen, and even hikers, and the ways in which more amicable and mutually beneficial relations between outdoorsmen and landowners might be attained.

Another essential problem that needs adequate study concerns the effects of reservoirs and other engineering works on given types of recreational use and values, as well as the ways in which the recreational potentials of indispensable engineering developments may be realized most fully.

The question of how best to use forest lands in both public and private ownership for recreation, has attained such importance nationally as to impel the initiation of a program in this field by the United States Department of Agriculture's Forest Service. The Potomac River Basin would benefit greatly by research of this kind, especially if undertaken in cooperation with other Federal and State agencies and with universities in the District of Columbia and in the surrounding States which have the skills and facilities to investigate the economic and social phases. The results of these studies would add greatly to the value of a comprehensive program for the basin.

Fish and wildlife research is needed to determine the capacity of given kinds of land and water areas in the basin to support different kinds of sport fish, commercial fish, waterfowl, fur-bearers, and other

small and large game, and the means whereby the full capabilities of the basin for these resources may be attained. The Fish and Wildlife Service of the United States Department of the Interior has initiated a modest inventory of the Potomac River and the probable effects of proposed reservoir developments. Investigations on a more complete scale await the availability of increased funds.

The sixth objective, building public understanding, is believed to be highly essential to the lasting success of a comprehensive river-basin development program. How well conflicts are resolved and stalemates broken will depend heavily upon the extent to which the objectives, and means of obtaining those objectives, are thoroughly understood by interested and intelligent citizens. The National Capital region is fortunate in having many residents who, by virtue of their relatively advanced education, training, and participation in civic affairs, are quite alert to proposals that affect their communities and quite competent to evaluate such proposals. The large number of citizens' associations and the variety of other types of civic and conservation groups dedicated to some phases of the metropolitan region's growth and development attest to this circumstance.

Well established informational and educational programs also operate in the rural portions of this basin. Maryland's program, for example, reaches from the State College of Agriculture, a land-grant college, through its agricultural experiment station and agricultural extension service to the individual farms in every county of the State. Besides the academic and vocational agronomic, conservation and other basic courses taught at, and the research activities of the University of Maryland, knowledge of new practices is made available through the county agents, 4–H Clubs, and other media. Organized plans and action programs are handled through such means as the soil-conservation districts and agricultural soil-conservation committees (11). (It is interesting to note that in response to the need by urbanites, for information on soil and water conservation and home beautification, Maryland's Montgomery County agent has added a landscape architect to his staff.) The other basin States have comparable progress.

Professional and lay organizations like the Society of American Foresters, Soil Conservation Society of America, American Society of Civil Engineers, American Planning and Civic Association, American Institute of Architects, National Parks Association, Wilderness Society, Izaak Walton League, Outdoor Writers Association, and many others, not only maintain national headquarters in the District of Columbia but also have local chapters which on occasion devote time and study to numerous matters directly affecting the Nation's Capital. For example, several organizations have expressed strong views against a proposed expressway through Rock Creek Park, proposed major storage dams at River Bend and elsewhere, and parkways that would ruin or seriously impair park areas.

Citizens also recognize the need to coordinate their various special interests with more general goals of the entire community. Federations have been organized to provide for relating specific problems to each other, educating individual organizations as to the significance of programs sponsored by other organizations, and on occasion to present unified positions on some specific proposal such as a highway, a

dam, the threatened destruction of park lands, the need for floodplain zoning, etc.

Examples of such federated organizations are the Potomac Valley Conservation and Recreation Council, a clearing house for some 50 civic and conservation groups within the District of Columbia and adjoining Maryland and Virginia; the Citizens Council for a Clean Potomac, whose original interest has widened far beyond the original goal of eliminating pollution, to such more positive and comprehensive questions as how the Potomac River Basin should be planned and developed; federations of citizens of the District of Columbia and of the metropolitan counties; the League of Women Voters; federations of women's clubs, garden clubs, and others.

These organizations have been multiplying with the spread of urbanization throughout the National Capital region. Initially, the interests of such groups are usually limited to matters of direct and immediate importance, such as street paving, traffic lights, sanitation, residential zoning, etc. But, as time goes on, their interests broaden to encompass matters of a larger community or even regional content. An example of a citizens group formed to reduce harmful flooding, etc., is the previously mentioned Rock Creek Watershed Association of the District of Columbia and Montgomery County, Md., organized in 1954. The following objectives of this association are directly applicable to the Rock Creek Watershed but can be applied elsewhere in the metropolitan region:

(1) Control over soil losses, storm runoff, and flooding in the urban, suburban and rural portions of the watershed, including farmlands, roads and highways, and public and private construction.

(2) More effective control of creek pollution from sewage, silt, and trash.

(3) More adequate provisions for both county-wide and community park and other recreational areas to help provide a fast-growing metropolitan population with pleasant environment and wholesome living.

(4) Development of a cooperative watershed improvement program including community beautification and restorative measures on the hill lands and along Rock Creek and its tributaries (12).

The South River Land and Water Conservation Association in Virginia's Shenandoah Valley is another example of effective voluntary group action to control floods and siltation emanating from damaged crop, pasture, and woodlands on the watershed. The work here is part of a larger undertaking on portions of the Potomac River Watershed authorized by the Congress in 1944, 1953, and 1955. This grassroots association is playing an important role in stimulating greater participation by farmers and in facilitating the coordination of activities (13).

The above are only a few of many illustrations showing how public understanding can be built to the point of facilitating intelligent action by the people themselves. Such efforts augur well for the successful outcome of a thoroughly thought out comprehensive program for the Potomac Basin. Once the interdependence of the metropolitan area's concerns with those of the basin as a whole is thoroughly understood and, once adequate information becomes available, the prospects for coordinated planning and program development should greatly be improved.

ACHIEVING COORDINATED ACTION

Precedents mean little in organizing for river-basin development. Each basin represents a separate entity, and what may apply to one may not apply elsewhere. So far as the Potomac River Basin is concerned, the Washington metropolitan area—whose core is the Federal City—represents a centralizing influence of the first importance. Most of the basin's people and economic and cultural interests will undoubtedly continue to concentrate here, and the recreational pursuits of the metropolitan's millions are bound to have an increasingly significant impact throughout the basin.

On the other hand, the four basin States also have strong interests and responsibilities and are undertaking studies, plans, and developments, many in cooperation with Federal agencies, that are contributing materially to the improvement of the soil, forest, water, wildlife, and recreational resources, thereby helping to meet the requirements imposed by increasing numbers of people. In addition to the State programs, a number of Federal agencies are more or less independently carrying on various activities in other parts of the basin. Their projects often involve firmly established cooperative relations with the States, as in the case of the soil and water conservation, tree planting, forest management, forest-fire protection and park, recreational, and wildlife habitat improvement and management activities of the Departments of Agriculture and the Interior. However, in the lack of overall coordination, and particularly in view of the fact that basin activities comprise only segments of the total programs of the respective State and Federal Governments, the emphasis on given fields and the rates of progress are bound to exhibit considerable variation.

In brief, there exists no one agency which concerns itself with the Potomac River Basin as an entity, or with the relation of the metropolitan region to the basin as a whole. The nearest approach is the Interstate Commission on the Potomac River Basin, a purely educational and advisory body of very limited powers and facilities.

What acceptable form of organization might best effectuate the goals of a comprehensive basin program is not clear cut in detail at this time. Any one of several alternatives might be feasible, depending, among other factors, upon the nature, scope, and urgency of the particular problems to be dealt with, the extent of coordination sought among the several major objectives of river-basin development, the economic outlook, and the temper of the times.

So far as the scope of this report is concerned, possible alternative forms of organization might include—

(1) A Federal Board of Review and Coordination.
(2) A Federal-State Interagency River Basin Committee.
(3) Extension of responsibilities of the Interstate Commission on the Potomac River Basin.

(1) *Federal Board of Review and Coordination.*—This Board would be composed of qualified citizens appointed by the President (subject to congressional approval) and supported by a competent technical land and water resource planning staff. The Board would look for broad policy guidance to a Congressional Joint Committee on the Potomac River Basin composed of representatives of the House and Senate District of Columbia Committees, Public Works Committees,

Agriculture Committees, and Committees on Interior and Insular Affairs of both House and Senate. The justification for such a special committee lies in the special Federal interests concentrated in this area, and the unique degree of coordination required.

The technical staff, after studies and consultations with various agencies and groups, would prepare estimates of the cost of conducting a complete comprehensive survey and developing an integrated land and water management and development plan for the basin. Upon authorization, the federally appropriated funds would be allocated by the Board among the Federal agencies—including those operating within the National Capital region—according to the nature and extent of their contributions. The States would be expected to participate, and grants-in-aid might be made available to stimulate more effective activities as indicated. Analyses of the survey findings, harmonization of conflicting elements, and recommendations for program development would be subject to thorough study and review. Results of the Board's findings would be transmitted to the above proposed joint congressional committee for final approval and authorization of appropriations for development. Appropriations would be allocated among Federal agencies and grants-in-aid allocated among the States for research and other purposes as determined by the committee. Expenditures would be subject to continuing review by the Board.

No board of this kind has yet been established in the United States, but it is believed that if Congress saw fit to set up the joint committee, as well as the Board, the chances of its functioning effectively would be quite favorable.

(2) *Federal-State Interagency River Basin Committee.*—This Committee would be composed of representatives of the Departments of the Army, Agriculture, Interior, Commerce, Federal Power Commission, and Health, Education, and Welfare, plus the four basin States and the District of Columbia. The Committee would constitute a program-coordinating body. It would consider the study, survey, planning, and development needs within the framework of a comprehensive program and recommend actions to meet deficiencies. Technical details would be handled by subcommittees and the results reported to the main Committee, and through it to the heads of the respective Federal departments and governors of the States for further consideration.

Funds for studies or surveys, on approval by the main Committee, would be incorporated as earmarked items in the budget estimates of the several agencies submitted to the applicable congressional committees. Policy and program conflicts would be resolved to the extent of the basin Committee's power. Unresolved questions would be passed on to the Executive and to the several congressional committees involved.

Committees of the above type have been established for several river basins. Thus far, however, they have not succeeded in resolving serious conflicts or in planning and carrying out thoroughly integrated programs. They have lacked authority to arrive at decisions on controversial matters and make them stick. One serious defect is that no single congressional committee has existed to whom such matters could be taken for decision.

(3) *Interstate Commission on the Potomac River Basin.*—The possibility of this advisory and educational Commission undertaking an

immediate study limited to the interrelations among land and water resources—recreation and wildlife in particular—represents another alternative. Much of the conflict over multiple-purpose development proposals revolves around the effects of land and river engineering structures on natural, historical, inspirational and related values, such as those represented by the Chesapeake & Ohio Canal, the Potomac Gorge below Great Falls, Rock Creek Park, and the Cacapon River.

A thorough, broad-gaged analysis of these conflicts is unquestionably among the most critical and pressing needs that face the basin today. The conflicts now prevailing will not be settled—at least not objectively or convincingly—so long as we continue to lack adequate information on the subject as a whole.

Action is badly needed. Currently existing shortages in local and regional facilities are being accentuated as one desirable site after another is preempted by subdivisions, private shooting preserves, summer-home estates, expressways, parkways, etc.

The educational and advisory experience of the Commission would stand to good advantage in such an assignment. It has succeeded in arousing community action on pollution control and watershed conservation. It has demonstrated an interest in the interrelations of land and water, as indicated by the activities of its independent citizens' advisory committees, including the one on recreation and wildlife. If adequate financing can be obtained, the study suggested above should help remove at least one major obstacle to enthusiastic public support of basin development proposals.

EARLY ACTION NEEDED

Whichever alternative is chosen, the pressures building up in the National Capital region and the basin at large cry for early and constructive relief. While it is not the purpose of this report to inquire in detail into specific current projects, nevertheless it is believed that early relief does not necessarily mean relief by the first or most obvious means at hand. Nor does it appear to call for actions that, while meeting an immediate or temporary need, may only serve to create worse pressures later on. Nor does it call for actions whose justifications rest on the uncoordinated myopic views of single-purpose specialists.

Genuine lasting relief calls first of all for balancing the presently uneven levels of information and understanding. A hard look at this situation should reveal where the major deficiencies are and what it will take to correct them. This report has attempted to do just that. It has also indicated some of the interrelationships that will need to be taken into account in raising the status of the Potomac River Basin to a level compatible with its national importance.

References

1. The Potomac, from volume 2, The Report of the President's Water Resources Policy Commission, 1950, page 20.
2. A Clean Potomac River in the Washington Metropolitan Area, by Abel Wolman, John C. Geyer, and Edwin E. Pyatt, Interstate Commission on the Potomac River Basin, Washington, D. C., October 1957, pages 11–14.
3. Potomac River Flood Control Survey Report Appendixes to House Document No. 269, 78th Congress, 1st session (mimeo), and Soil-Site Relationships and Species Comparison Tests in the Southern Appalachians, by Warren T. Doolittle, United States Forest Service, November 19, 1957 (mimeo).

4. Effects of Major River Basin Development on Watershed Improvement, by Albert S. Fry, Journal of Soil and Water Conservation, volume 12 (2), pages 65–70, March 1957.
5. No Man's Land, by Jeptha J. Carroll, in Public Works, volume 85 (3), pages 73–74, March 1954.
6. The Potomac, page 1.
7. A Comprehensive Conservation Plan for the Potomac Valley Conservancy District, by William S. Swingler, in Conservation Measures for the Potomac Valley Conservancy District, Interstate Commission on Potomac River Basin, 1955, as modified by data from United States Soil Conservation Service as of June 30, 1957.
8. Under All is the Land, by Tom Dale, Soil Conservation, volume 23 (3), pages 51–56, October 1957.
9. The Potomac, page 15.
10. Potomac River Basin: Research, Planning, Development, Studies in Business and Economics, University of Maryland, volume 11 (3), December 1957, page 19.
11. The Relationship of Agricultural Programs in Maryland to Watershed Management, by G. M. Cairns, in Watershed Management, Interstate Commission on Potomac River Basin, 1956, pages 13–15.
12. A Suggested Program for the Rock Creek Watershed Association in D. C. and Maryland, by Bernard Frank, March 7, 1955 (mimeo).
13. Organization and Operation of the South River Watershed, by Frank F. Carr, in Upstream Conservation, Interstate Commission on Potomac River Basin, 1957, pages 23–29.

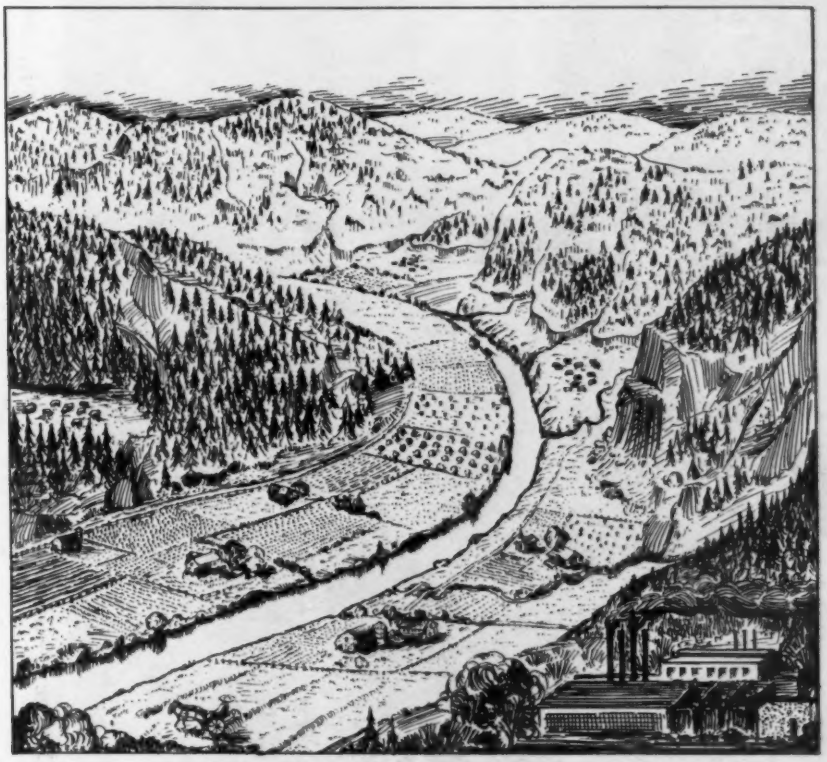


FIGURE 2.—Well managed watersheds produce clean water, wholesome recreation and wildlife opportunities, and useful farm and forest products. (U. S. Forest Service.)

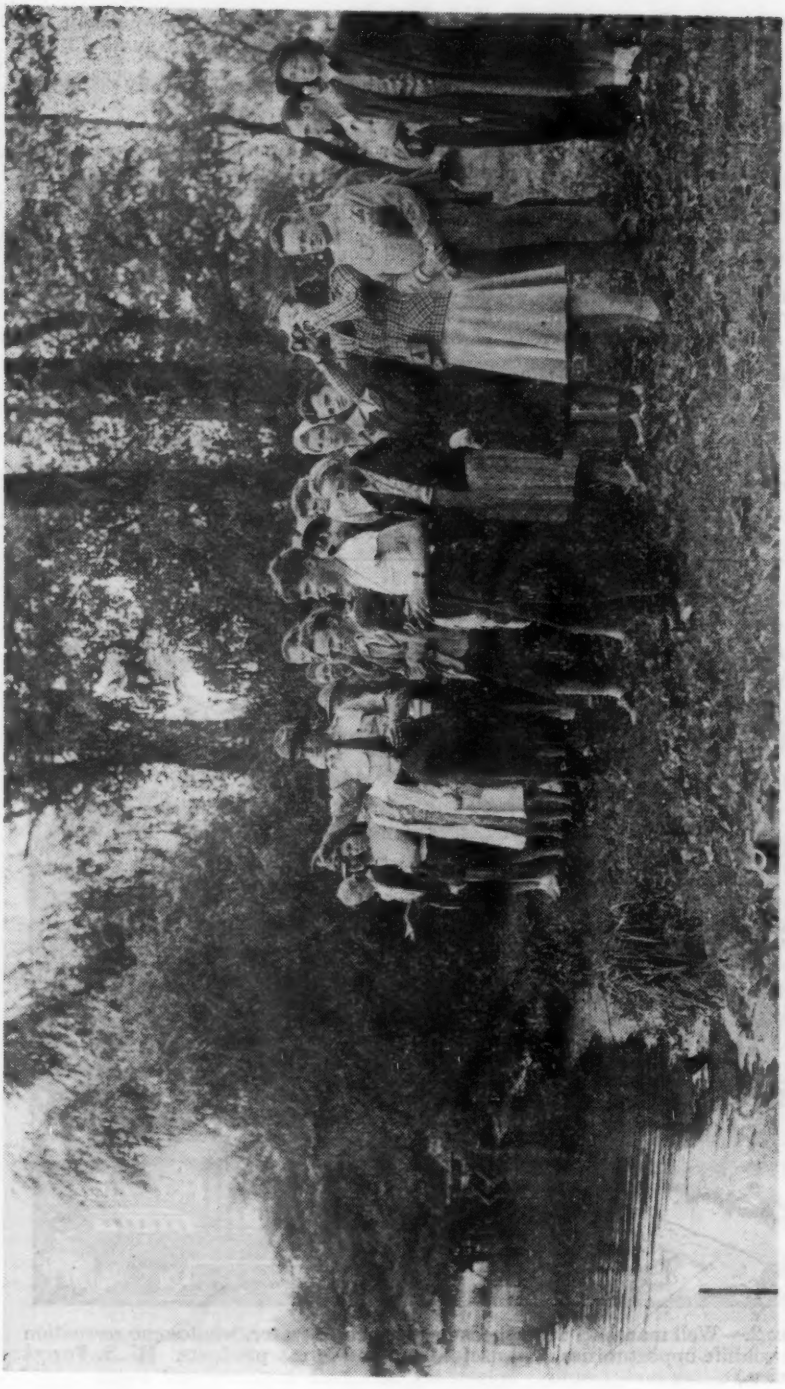


FIGURE 3.—Guided nature walks enrich our understanding and enjoyment of the out-of-doors (National Park Service).

FIGURE 4.—Opportunities to enjoy the woods and waters are being sought increasingly by urban families (Virginia Conservation Commission).

○